AI + Meteorology:

Requiring Legal Promotion and Regulation

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China Meteorological Administration (CMA)

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Outline

01 AI: Advantages and Challenges

02 Practice of Governance of AI Meteorological Application

03 Discussion of views

AI: Opportunities and Challenges coexist

- Currently, we are in a period of rapid development of AI in field of Earth system science, with AI achieving remarkable results of assisting in near-term forecasting, data-driven weather prediction, and climate forecasting etc.
- Meanwhile, we are also facing with the unprecedented challenges that AI bring to our meteorological fields, conflicting with the responsibility and operations of National Meteorological and Hydrological Services (NMHSs).

AI: Advantages

AI application are beneficial to improve observations & data analysis ,enhancing forecast skill, improving high-impact event predictions (cyclones, floods), lowering computational costs, aiding resource-constrained NMHSs, optimizing future observational infrastructure for data-sparse regions.

- **Improve Observations & DA**: Enhances observation Quality Assurance, addresses sparsity via in-filling, and optimizes future observational infrastructure for data-sparse regions.
- **Enhance Forecast Skill**: MLWP rivals NWP in accuracy across metrics like nowcasting and S2S improving high-impact event predictions (cyclones, floods) with post-processing gains.
- **Strenthen Early Warnings:** Boosts high-impact event prediciton, aligning with EW4All to protect vulnerable regions.
- **Lower Computational Costs**: Requires less computing than NWP; model distillation and GPU acceleration reduce energy use, aiding resource-constrained NMHSs.

AI: Challenges

In practical applications, with the integration of AI into traditional meteorological systems, some challenges come for us to face.

- The authoritative voices in disaster prevention and mitigation are in risk of being disrupted by AI-driven prediction and early warning decisionsand the legal reliability and responsibility need to be clarified.
- Bias in prediction and warning due to bias from training datum, model architectures, or the subjective judgments of model developers.
- A quality inspection system for AI application needs to be built.
- The ethical and social responsibilities need to be ensured.
- The ownership of intellectual property needs further clarification.
- Public-Private Engagement (PPE) regulation is needy.

Multiple Stakeholders and "Single-voice principle"

As AI-based weather and climate predictions become increasingly accessible, maintaining a "single-voice principle" in a heterogeneous environment of multiple stakeholders come to be a hot topic.

- Governance should prioritize public safety and foster collaborations that leverage private sector innovations to fill gaps in meteorological services, while respecting the core mandates of NMHSs.
- Clarifying responsibility for public prediction and warnings is critical to such collaborations, and mitigate risks of fragmented or exaggerated messaging or unaccountable decision-making.

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Global AI Governance Landscape

- Currently, major countries with advanced AI technologies have begun taking proactive actions towards AI governance.
- In December 2023, the European Union passed the world's first regulatory legislation for artificial intelligence, the "Artificial Intelligence Act”.
- In recent years, China has taken solid steps in the path of AI governance with specific actions as mufti-dimensional exploration, ethical guidelines, comprehensive regulations and technical safety measures.
- On August 26, 2025, China (the State Council)newly issued a guideline on Tuesday to implement the "AI Plus" initiative, the country will bolster the application of AI in science and technology, industrial development, consumption upgrades, people's well-being, **governance** and global cooperation.

Practice of Governance on Artificial Intelligence Meteorological Application Service

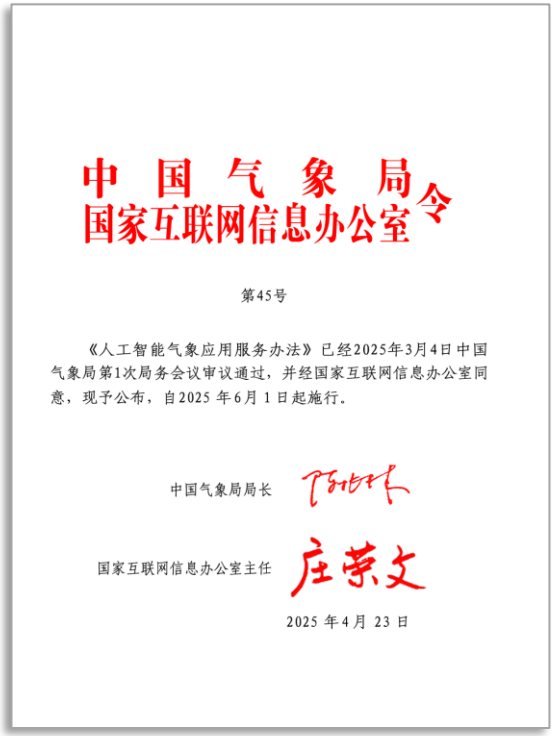
- Comprehensive AI governance is imperative to harness its benefits while addressing challenges both from general AI and meteorological AI.
- To encourage , promote and regulate the healthy and orderly AI-based meteorological application and services, **China Meteorological Administration(CMA)** and **Cyberspace Administration of China** have jointly formulated the national regulation titled **Regulatory Measures for AI - based Meteorological Application and Services**, coming into force from June 1, 2025.
- **Core Principles of the Regulatory Measures：**

✓ Play a regulatory role while fostering innovation

✓ Impose clear rules without stifling technological progress

✓ Counteract risks (e.g., data misuse, algorithmic bias) while ensuring adaptability.

Regulatory Measures for AI - based Meteorological Application and Services



中 国 气 象 局
国家互联网信息办公室令

第45号

《人工智能气象应用服务办法》已经2025年3月4日中国气象局第1次局务会议审议通过，并经国家互联网信息办公室同意，现予公布，自2025 年6月 1 日起施行。

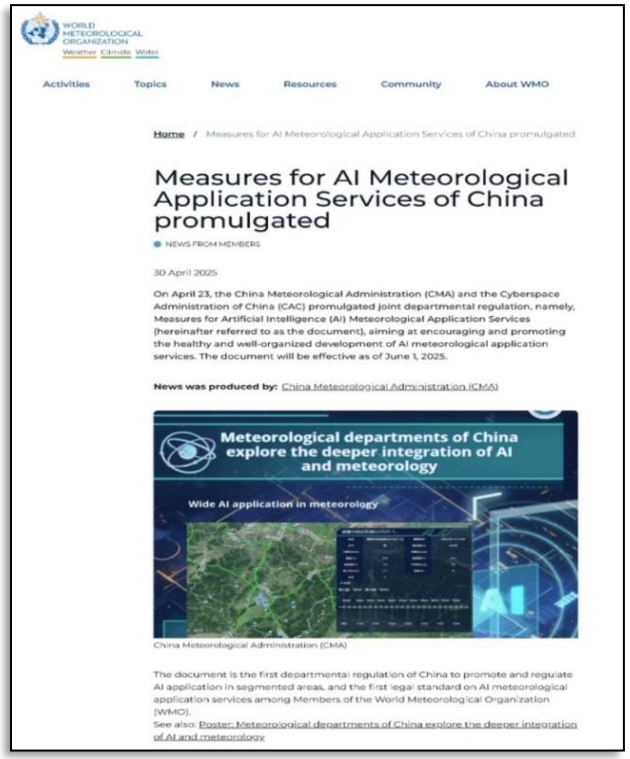
中国气象局局长

国家互联网信息办公室主任 庄荣文

2025 年4月 23 日

Five Chapters:

- General Provisions
- Support and Promotion
- Application and Service Specifications
- Supervision and Management
- Supplementary Provisions



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NEWS FROM MEMBERS

30 April 2025

On April 23, the China Meteorological Administration (CMA) and the Cyberspace Administration of China (CAC) promulgated joint departmental regulation, namely, Measures for Artificial Intelligence (AI) Meteorological Application Services (hereinafter referred to as the document), aiming at encouraging and promoting the healthy and well-organized development of AI meteorological application services. The document will be effective as of June 1, 2025.

News was produced by: China Meteorological Administration (CMA)

China Meteorological Administration (CMA)

The document is the first departmental regulation of China to promote and regulate AI application in segmented areas, and the first legal standard on AI meteorological application services among Members of the World Meteorological Organization (WMO).

See also: Poster: Meteorological departments of China explore the deeper integration of AI and meteorology

WMO website published the news immediately

The document is the first **departmental regulation of China** to promote and regulate AI application in segmented areas , and the **first legal standard on AI** meteorological application services among **Members of WMO**

The regulation reflects China's Legislation Progress in Meteorology

China have been building up the meteorological legislative system consisting of meteorological law ,administrative regulations, departmental rules, local regulations, local government regulations and meteorological standards.

1994

Issued by the State Council as the first meteorological regulation

Meteorological Regulation of PRC

1999

Meteorological Law of PRC

Issued by National People's Congress

2002

Issued by the State Council

Regulations on the Management of Weather Modification

2010

Regulations on Prevention of Meteorological Disasters

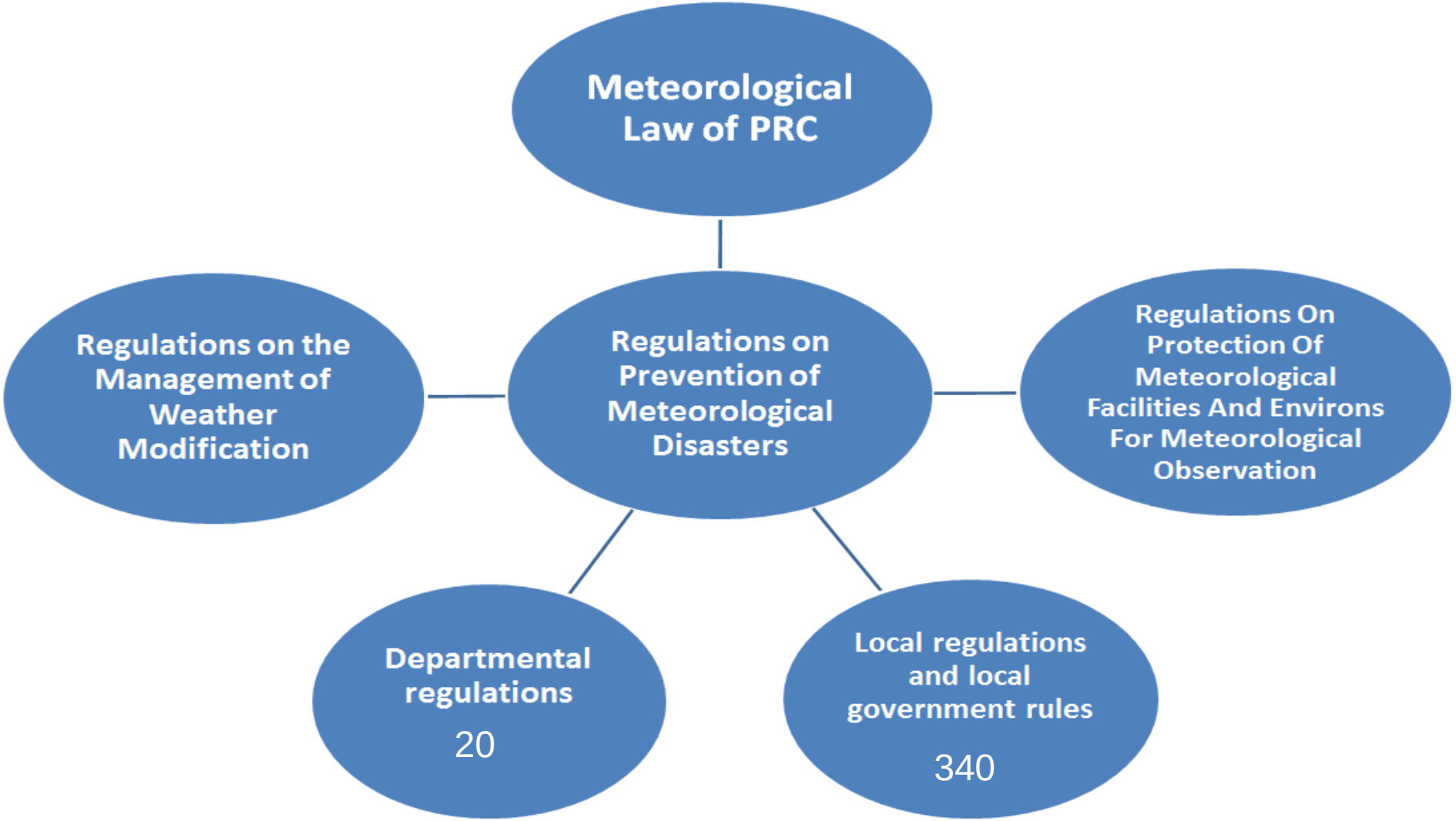
Issued by the State Council

2012

Issued by the State Council

Regulations On Protection Of Meteorological Facilities and Environs For Meteorological Observation

Meteorological Legal System of China



CMA Departmental Rules

- ✓ The departmental regulations of the CMA are an important component and extension of the meteorological legislative system covering various aspects of meteorological fields.
- ✓ Among them, **《Measures for Artificial Intelligence Meteorological Application Services》** is the newest one for the newly emerging AI field.

Rule Number and name

< 2 >Rules for Meteorological Administrative Reconsideration
< 4 >Rules for Sharing Meteorological Data
<16>Rules for Issuing and Spreading Meteorological Disaster Warning Signals
<18>Rules for Climate Feasibility Demonstration
<26>Rules for the Issuance and Dissemination of Meteorological Forecasts
<27>Rules for Meteorological Information Services
<28>Rules for the License of Meteorological Special Technical Equipment
<29>Licensing Rules for Avoiding Hazards to Meteorological Detection Environment in New, Expanded, and Reconstructed Construction Projects
<30>Licensing Rules for Relocation and Construction of Meteorological Stations
<31>Rules for Qualification of Lightning Protection Device Testing
<33>Implementation Rules for Meteorological Administrative Licensing
<34>Rules on the Management of Meteorological Industry
<36>Rules for Balloon Launch
<37>Rules on Design Review and Completion Acceptance of Lightning Protection Devices
< 39>Rules for Meteorological Administrative Normative Documents
<40>Rules for Foreign Meteorological Observation and Data Management
<42>Rules for Meteorological Administrative Penalties
<43>Rules for Naming and Renaming Meteorological Facilities with Important Geographic Significance
<44>Rules for Lightning Protection and Disaster Reduction
<45>Measures for Artificial Intelligence Meteorological Application Services

Core Design Principles

Balancing development and security

Coordinating promotion of new technology development

and ensuring orderly development by means of law

- Advancing AI continuously generates new "AI+Meteorology" applications and scenarios.
- The regulation Established provisions to encourage, support and promote AI application in weather services, meanwhile set rues for regulating application activities orderly and safely.
- Agile governance idea: conduct dynamic adjustments based on technological advancements
- Prudent and Inclusive Regulation–Encouraging innovation while establishing risk controls
- Tiered & Classified Oversight based on risk levels

✓ High-risk applications (e.g., disaster forecasting) require strict compliance.

✓ Low-risk applications (e.g., tourism weather apps) benefit from light-touch regulation.

Provisions set for promoting AI application in meteorology

- **Data Openness and Sharing.** To establish basic databases for AI appliation for promoting data opening and sharing.
- **Algorithm and Model R&D.** To develope the computing infrastructure for supporting algorithm and model innovation oriented towards application and services.
- **Empowerment of Application Scenarios.** To carry out demonstrations of AI-based meteorological application for encouraging the development of service scenarios in needy fields .
- **Build up Partnership.** Collaborating with enterprises, universities and research institutes, China's meteorological authorities will establish coordinated development and governance mechanisms to mobilize AI adoption and fuel high-quality meteorological progress.
- **Demonstration.** In recently two years, CMA have released a suite of AI weather forecasting models (Fenglei, Fengqing, Fengshun etc.), harnessing AI Innovative Achievements of **Tsinghua University, Fudan University ,Huawei Company etc.**

Strengthening public-private-academic collaboration and accelerating delivery of the transformative potential of AI in advancing weather and climate prediction and services

Provisions set for regulating AI application orderly and healthly

Weather forecasting or warning are crucial for public safety, so application of AI in weather services require verification and responsibility clarifying regarding the accountability and quality control.

- **Service filed for record.** Legal persons and other organizations providing meteorological information services are requried to file for record with the provincial meteorological authority for business license registration and supervision.
- **Data be labeled.** Providers are required to obtain meteorological data with corresponding identity labels (data source, property, using limit etc.) through legal channels.
- **Algorithms filed for record.** Providers are required to conduct algorithm filing and security assessments in accordance with relevant national regulations.

Provisions set for regulating AI application running orderly and healthly

- **Content be labeled.** Providers are required to add labels for AI-generated or synthesized weather service products, so that the reliability , security as well as information traceability can be ensured.
- **Dissemination comply with laws.** Providers are required to release and disseminate public weather forecasts, severe weather warnings provided by meteorological stations affiliated with

Meteorological Law of PRC, Article 22

The state implements a unified release system for public meteorological forecasts and severe weather warnings. Meteorological stations and stations under the jurisdiction of meteorological authorities at all levels shall issue public meteorological forecasts and severe weather warnings to the society in accordance with their responsibilities, and timely supplement or revise them according to weather changes.

Other organization or individual are not allowed to issue public weather forecasts and severe weather warnings to the society.

This legal framework ensures effective regulation while adapting to rapid AI advancements in meteorology

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Relationship between public institutions and private organizations

- **How to strengthen the partnership between public institutions and private organizations in advancing weather prediction cap?**
- Private companies like Pangu-Weather, GraphCast, GenCas etc have made notable advancement in developing Machine Learning Weather Prediction models exhibiting promising accuracy and computational efficiency and start a new era of meteorology with AI.
- However, AI-driven forecasting models rely heavily on foundational public resources and real-time meteorological observation data, a domain primarily managed by NMHSs playing critical roles in data stewardship, validation, and operational deployment.
- Through Strengthening public and private collaboration, meteorological expertise can be integrated into MLWP models ensuring MLWP products are scientifically robust and accurate.
- This approach contributes to fostering a collaborative framework for intellectual property rights, licensing and fair-use policies while protecting both the public and private interests and incentives.

The governance of AI applications in meteorology is still on the way

- Although groundbreaking advancement has been seen with AI application in meteorology and climatology over the past several years, few AI governance actions were proposed in this domain.
- Although China have released AI regulation for meteorological applications, the practice and exploration are still on the road.
- An irreplaceable role of WMO should be played in promoting and regulating AI application in meteorological fields around the world.
- Strengthen global coordination and implement Roadmap to build up “Mufti-Layered Regulatory System.

✓ International organizations WMO, etc , develops guiding principles, promotes mutual recognition of

✓ Standards, stars Pilot Projects using international initiatives to test best practices.

✓ National meteorological authorities, establishes unified rules, coordinates enforcement.

✓ Local agencies, implements localized oversight, adapts to regional needs.

Thank you for your attention